

The Claims Defining the Invention are as Follows

1. An *in situ* desalination apparatus comprising a reverse osmosis unit having a reverse osmosis medium, the reverse osmosis unit in use to be located within a body of water, the unit having an inlet opening to one side of the reverse osmosis medium, in use the inlet to be located below the upper surface of a body of water, the unit having a concentrate outlet opening to the one side of the reverse osmosis medium and opening into the exterior of the housing at a position spaced below the inlet, the unit having a permeate outlet opening to the other side of the reverse osmosis medium, the permeate outlet communicating with a delivery line extending from the body of water, a pump between body of water and the reverse osmosis unit and adapted to pressurise the water located at the one side of the reverse osmosis medium.
2. An *in situ* desalination apparatus as claimed at claim 1 wherein the permeate outlet is associated with a pumping means adapted to extract permeate passing through the reverse osmosis medium.
3. An *in situ* desalination apparatus as claimed at claim 1 or 2 wherein the permeate outlet is vented to the atmosphere.
4. An *in situ* desalination apparatus as claimed at claim 1 or 2 or 3 wherein the body of water comprises a body of surface water which can comprise a lake, river, ocean, estuary or like body of water.
5. An *in situ* desalination apparatus as claimed at claim 4 wherein the body of water comprises an underground aquifer and the upper surface comprises the water table and/or piezometric surface of the reservoir.
6. An *in situ* desalination apparatus as claimed at claim 5 wherein the reverse osmosis unit is adapted to be located within a bore hole extending into the aquifer.

7. An *in situ* desalination apparatus as claimed at any one of the preceding claims wherein the reverse osmosis unit comprises a at least two first reverse osmosis units connected to the inlet in parallel.
8. An *in situ* desalination apparatus as claimed at claim 7 wherein the reverse
5 osmosis unit comprises a second set of reverse osmosis units connected in series downstream from the first set of reverse osmosis units, the concentrate outlet of the second reverse osmosis units being subjected to the hydrostatic pressure representative of the lower most position of the apparatus within the body of water which is less than the pressure applied to the one side of the
10 reverse osmosis medium.
9. An *in situ* desalination apparatus as claimed at claim 8 wherein of the first and second sets of reverse osmosis units comprise a set of reverse osmosis cells.
10. An *in situ* desalination apparatus as claimed at any one of the preceding claims wherein the pump and pumping means comprise a common pump
15 connected to the inlet and the permeate outlet through a set of valves whereby said common pump is able to introduce said water into the inlet and deliver permeate from the permeate outlet through a controlled activation of the valves.
11. An *in situ* desalination apparatus comprising a length of tubular casing
20 adapted in use to be located in a bore hole, two screened portions at axially spaced locations along the length of casing below the water level in the borehole, a sealing means between the screened portions within the casing and subdividing the interior of the casing into an upper portion and a lower portion, the sealing member located between the screened portions, the
25 casing supporting a reverse osmosis unit having a reverse osmosis medium, the unit having an inlet providing communication between the upper portion of the interior of the casing and one side of the reverse osmosis medium, the unit having a concentrate outlet providing communication between the one side of the reverse osmosis medium and the lower portion of the interior of the
30 casing, the unit having a permeate outlet opening to the other side of the

reverse osmosis medium, the permeate outlet communicating with a delivery line extending from the body of water, a pump adapted to deliver water under pressure from the upper portion of the interior of the casing to the inlet, whereby the pressure differential created across the reverse osmosis medium will facilitate reverse osmosis.

12. An *in situ* desalination apparatus as claimed at claim 11 wherein the permeate outlet is associated with a pumping means adapted to extract permeate passing through the reverse osmosis medium.
13. An *in situ* desalination apparatus as claimed at claim 11 or 12 wherein the permeate outlet is vented to the atmosphere.
14. An *in situ* desalination apparatus as claimed at any one of claims 11 to 13 wherein the reverse osmosis unit comprises at least two first reverse osmosis units connected to the inlet in parallel.
15. An *in situ* desalination apparatus as claimed at claim 14 wherein the reverse osmosis unit comprises a second set of reverse osmosis units connected in series downstream from the first set of reverse osmosis units, the concentrate outlet of the second reverse osmosis units being subjected to the hydrostatic pressure representative of the lower most position of the apparatus within the body of water which is less than the pressure applied to the one side of the reverse osmosis medium.
16. An *in situ* desalination apparatus as claimed at claim 15 wherein of the first and second sets of reverse osmosis units comprise a set of reverse osmosis cells.
17. An *in situ* desalination apparatus as claimed at any one of claims 11 to 16 wherein the concentrate outlet is controlled by a exhaust valve which will be closed upon the pressure at the one side of the reverse osmosis medium falling below a pressure of predetermined magnitude which shall be at least equal to the desired operating pressure of the reverse osmosis unit.

18. An *in situ* desalination apparatus as claimed at any one of claims 11 to 17 wherein the sealing means comprises an inflatable packer which can be selectively inflated to provide the sealing.
19. An *in situ* desalination apparatus as claimed at any one of claim 11 to 18
5 wherein the housing, pump and sealing means comprise a unit which is removable from the length of casing.
20. An *in situ* desalination apparatus as claimed at any one of claims 11 to 19 wherein the length of casing comprises a portion of a bore hole casing.
21. An *in situ* desalination apparatus as claimed at any one of claims 11 to 20
10 wherein the length of casing is adapted to be located at the lower end of a bore hole casing.
22. An *in situ* desalination apparatus adapted to be located in a bore hole casing located in a bore hole, the casing having a screened portions at a position below the water level in the casing, the apparatus comprising a sealing means
15 receivable within the casing in the region of the screened portion and adapted in use to subdivide the interior of the casing into an upper portion and a lower portion, the sealing member located between the screened portions, the apparatus further comprising a reverse osmosis unit having a reverse osmosis medium, the unit having an inlet providing communication between the upper
20 portion of the interior of the casing and one side of the reverse osmosis medium, the unit having a concentrate outlet providing communication between the one side of the reverse osmosis medium and the lower portion of the interior of the casing, the unit having a permeate outlet opening to the other side of the reverse osmosis medium, the permeate outlet
25 communicating with a delivery line extending from the body of water, the apparatus further comprising a pump adapted to deliver water under pressure from the upper portion of the interior of the casing to the inlet, whereby the pressure differential created across the reverse osmosis medium will facilitate reverse osmosis.

23. An *in situ* desalination apparatus as claimed at claim 22 wherein the screened portion comprises two screened portions at axially spaced locations along the length of the casing and the sealing means in use is intended to engage the inner face of the casing such that the upper portion communicates with the upper most screen.
24. An *in situ* desalination apparatus as claimed at claim 22 or 23 wherein the permeate outlet is associated with a pumping means adapted to extract permeate passing through the reverse osmosis medium.
25. An *in situ* desalination apparatus as claimed at claim 22 or 23 or 24 wherein the permeate outlet is vented to the atmosphere.
26. An *in situ* desalination apparatus as claimed at any one of claims 22 to 25 wherein the reverse osmosis unit comprises at least two first reverse osmosis units connected to the inlet in parallel.
27. An *in situ* desalination apparatus as claimed at claim 26 wherein the reverse osmosis unit comprises a second set of reverse osmosis units connected in series downstream from the first set of reverse osmosis units, the concentrate outlet of the second reverse osmosis units being subjected to the hydrostatic pressure representative of the lower most position of the apparatus within the body of water which is less than the pressure applied to the one side of the reverse osmosis medium.
28. An *in situ* desalination apparatus as claimed at claim 27 wherein of the first and second sets of reverse osmosis units comprise a set of reverse osmosis cells.
29. An *in situ* desalination apparatus as claimed at any one of claims 22 to 28 wherein the concentrate outlet is controlled by an exhaust valve which will be closed upon the pressure at the one side of the reverse osmosis medium falling below a pressure of predetermined magnitude which shall be at least equal to the desired operating pressure of the reverse osmosis unit.

30. An *in situ* desalination apparatus as claimed at any one of claims 22 to 29 wherein the sealing means comprises an inflatable packer which can be selectively inflated to provide the sealing.
- 5 31. An *in situ* desalination apparatus as claimed at claim 30 wherein the sealing means further comprises a sleeve which is receivable in the screened portion to provide two screened portions at axially spaced locations along the length of the casing.
- 10 32. An *in situ* desalination apparatus as claimed at any one of claim 22 to 31 wherein the housing, pump and sealing means comprise a unit which is removable from the length of casing.
33. An *in situ* desalination apparatus substantially as herein described with reference to the accompanying drawings.